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|---|-------------|----------------------|-------------------------|------------------|
| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 09/668,199 | 09/22/2000 | NAOFAL AL-DHAHIR | AL-DHAHIR 2 | 9867 |
| 7590 | 11/12/2003 | | EXAMINER | |
| HENRY T BRENDZEL P.O. BOX 574 SPRINGFIELD, NJ 07081 | | | WARE, CICELY Q | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2634 | |
| | | | DATE MAILED: 11/12/2003 | 2 |

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 09/668,199 | AL-DHAHIR, NAOFAL | |
| | Examiner | Art Unit | |
| | Cicely Ware | 2634 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 27 October 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-18 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:
 - a. Pg. 2, line 27, applicant uses the phrase "in accord with". Examiner suggests the phrase "in accordance with" for clarification purposes.
 - b. Pg. 6, line 21, examiner suggests omitting "that" for clarification purposes.
 - c. Pg. 8, line 20, examiner suggests substituting "In" with "It" for clarification purposes.
 - d. Pg. 8, line 25, examiner suggests omitting "is" for clarification purposes.
 - e. Pg. 9, line 6, examiner suggest re-writing this line for clarification purposes.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.
3. Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-18 are vague and indefinite. Applicant makes reference to symbols n_0 , n_i , N_f . Examiner suggests applicant explain the length

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of the subscript (e.g. i=1.....n-1) or omit the use of subscripts. Examiner suggests applicant thoroughly review claims because these symbols make the claims unclear.

4. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Examiner assumes that claim 14 is a dependent claim. Examiner suggests applicant re-write claim for clarity. Applicant makes reference to a matrix W_q . The reference to this matrix is unclear.

5. Claims 6 and 9 recite the limitation "said transmission channel". There is insufficient antecedent basis for these limitations in the claims.

6. Claim 11 recites the limitation "said transmission channel that were encoded in a space-time encoding schema". There is insufficient antecedent basis for these limitations in the claims.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US Patent 6,314,147) in view of Bang (EPO 0538218 A1).

(1) With regard to claim 1, Liang et al. discloses in (Fig. 2 and 3) a receiver responsive to an antenna comprising: a pre-filter having a plurality of FIR filters, each responsive to a signal that is derived from one of the antennas and applied to an input point, and each developing an output signal that contributes to one of the pre-filter outputs (col. 5, lines 45-46; col. 7, lines 23-25, lines 43-45). However Liang et al. does not disclose a decision logic responsive to the filter outputs.

However Bang discloses a decision logic responsive to the filter outputs (col. 1, lines 37-38; col. 7, line 1).

Therefore it would have been obvious to one of ordinary skill in the art to modify Liang et al. to incorporate the use of decision logic in order to read the real and imaginary parts of the complex valued pre-filter outputs to output a +1 or -1 depending on the sign of the complex value. The determined sign is fed back and forms a measure of the certainty in the decision circuit and provide "soft" information in the channel decoder.

(2) With regard to claim 2, claim 2 inherits all the limitations of claim 1. Liang et al. further discloses a receiver comprising a sampling circuit interposed between a plurality of antennas and pre-filter that samples the received signal (col. 5, lines 48-60).

However Liang et al. does not explicitly disclose a sampling rate of $T_s = T/I$, the sampling theorem is well known in the art where values are samples at uniform intervals where $T_s=1/2f_m$ and the upper limit on T_s can be expressed in terms of the sampling rate, denoted by $f_s=1/T_s$.

(3) With regard to claim 3, claim 3 inherits all the limitations of claim 2. However Liang et al. does not explicitly disclose a sampling rate of $T_s = T/I$, the sampling theorem is well known in the art where values are samples at uniform intervals where $T_s=1/2f_m$ where ($-f_m < f < f_m$) the upper limit on T_s can be expressed in terms of the sampling rate, denoted by $f_s=1/T_s$.

(4) With regard to claim 4, claim 4 inherits all the limitations of claim 1. Bang further discloses where coefficients of said FIR filters are computed in a processor in response to a block of symbols (col. 3, lines 53-58, col. 4, lines 1-6)

(5) With regard to claim 5, claim 5 inherits all the limitations of claim 4. Bang further discloses the processor as part of said pre-filter (col. 4, lines 1-6).

(6) With regard to claim 6, claim 6 inherits all the limitations of claim 4. Bang further discloses said coefficients of said FIR filters are computed once every time interval during which transfer characteristics of said transmission channel are substantially constant (col. 3, lines 53-58, col. 4, lines 1-41).

(7) With regard to claim 7, claim 7 inherits all the limitations of claim 6. Furthermore Bang discloses where said processor installs computed coefficients of said FIR filters in said FIR filters following each computation (col. 4, lines 14-21).

(8) With regard to claim 8, claim 8 inherits all the limitations of claim 1. Furthermore Bang discloses in Fig. 4, where said FIR filters form an array of filters, and said array has one FIR filter connected between each input points and outputs.

8. Claims 9, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US Patent 6,314,147) in combination with Bang (EPO 0538218 A1) as applied to claim 8 above, and further in view of Raleigh (US Patent 6,219,561).

(1) With regard to claim 9, claim 9 inherits all the limitation of claim 8. However Liang et al. in combination with Bang do not disclose where the plurality of antennas receive signals, via said transmission channel, which are from a transmitter having a multiple number of transmitting antennas.

However, Raleigh discloses in Fig. 2B where the plurality of antennas receive signals, via said transmission channel, which are from a transmitter having a multiple number of transmitting antennas.

Therefore it would have been obvious to one of ordinary skill in the art to modify the inventions of Liang et al. in combination with Bang to specify where the plurality of antennas, receive signals via said transmission channel, which are from a transmitter having a multiple number of transmitting antennas in order to provide identical radiation characteristics when operating at the receive and transmit frequencies, respectively.

(2) With regard to claim 10, claim 10 inherits all the limitations of claim 9. Furthermore Raleigh discloses in Fig. 2B where said transmitter has transmitting antennas.

(3) With regard to claim 11, claim 11 inherits all the limitations of claim 10. Bang further discloses wherein said decision logic is adapted to receive from said transmitted signals that were encoded in a space-time encoding schema (col. 6, lines 57-58, col. 7, lines 1-2).

9. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liang et al. (US Patent 6,314,147) in combination with Bang (EPO 0538218 A1) in further view of Karlsson et al. (US Patent 6,470,192)

(1) With regard to claim 12, claim 12 inherits all the limitations of claim 2. Liang et al. in combination with Bang disclose all the limitations of claim 2. However Liang et al. in combination with Bang do not disclose the receiver where said plurality of FIR filters are expressed by a matrix, comprising an autocorrelation matrix of a block of signals transmitted by a plurality of transmitting antennas to input antennas via a channel having a transfer characteristic, an autocorrelation matrix of noise received by said plurality of input antennas and a sub-matrix.

However Karlsson et al. discloses the receiver where said plurality of FIR filters are expressed by a matrix and computed by an autocorrelation matrix of a block of signals transmitted by a plurality of transmitting antennas via a channel having a transfer characteristic. An autocorrelation matrix of noise is received by the plurality of antennas during the block of signals transmitted by the transmitting antennas and a sub-matrix is subject to a selected constraint, being the error autocorrelation function (col. 5, lines 30-67; col. 6, lines 6-67; col. 7, lines 1-67; col. 8, lines 1-22).

Therefore it would have been obvious to one of ordinary skill in the art to modify the inventions of Liang et al. in combination with Bang to specify the receiver where said plurality of FIR filters are expressed by a matrix and computed by an autocorrelation matrix of a block of signals transmitted by a plurality of transmitting antennas via a channel having a transfer characteristic. An autocorrelation matrix of noise is received

by the plurality of antennas during the block of signals transmitted by the transmitting antennas and a sub-matrix is subject to a selected constraint, being the error autocorrelation function in order to synchronize the base stations and estimate the noise during the training sequence.

(2) With regard to claim 13, claim 13 inherits all the limitations of claim 12. Furthermore, Karlsson discloses the receiver wherein the plurality of FIR filters are subjected to designer constraints relative to any one or a number of member of the following set: transmission channel memory, size of said block, effective memory of the combination consisting of said transmission channel and said pre-filter, autocorrelation matrix, autocorrelation matrix value of factor in said sampling circuit, and decision delay (col. 5, lines 30-67; col. 6, lines 6-67; col. 7, lines 1-67; col. 8, lines 1-22).

Allowable Subject Matter

10. Claim 15-18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Spurbeck et al. US Patent 5,717,619 discloses a method and apparatus for computing, in real time, the coefficients of a time varying FIR filter.

b. Ifeachor et al. Digital Signal Processing A Practical Approach 1993 discloses the correlation process.

c. Hunsinger et al. US Patent 5,465,396 discloses a system for in-band on-channel digital broadcasting.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cicely Ware whose telephone number is 703-305-8326. The examiner can normally be reached on Monday – Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703-305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Cicely Ware

cqw
October 27, 2003



STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600